FINAL Minutes of IHRA Steering Committee Meeting
Thursday, June 24, 1999
14.00 - 18.00
Meeting Room A,
U.S. Mission
Geneva, Switzerland

Attendees:

Australia	John McLucas	**Poland**	Wojtek Przybylski
Canada	Brian Jonah	**Sweden**	Anders Lie
EC	Viola Groebner	**The Netherlands**	Gerard J.M. Meekel
EEVC	Bernd Friedel	**United Kingdom**	John Jeyes
France	Dominique Cesari		Richard Lowne
Hungary	Sándor Szabó	**United States**	Raymond P. Owings
Italy	Claudio Lomonaco		Donna E. Gilmore
Japan	Yoshiyuki Mizuno		Julie Abraham
	Kazuhiko Morisaki		

Agenda Items:

- Welcome & Approval of November 1998 Minutes
- Side Impact
- Working Group Status Reports
- IHRA Web Site
- DG Letter & OICA Proposal
- New Business
- Next Meeting

Welcome & Approval of November 1998 Minutes:
IHRA Chairman, Mr. Raymond P. Owings, called the meeting to order at 14.10 and asked all attendees to introduce themselves. Ms. Donna E. Gilmore, ESV Technical Coordinator, was introduced as the alternate IHRA Secretariat, and facilitated the ESV Conference Planning Meeting the following day. The Committee was given time to review draft minutes of the November, 1998, meeting. Approved minutes will be posted on IHRA Web Site in one month.

Side Impact:
Mr. John McLucas presented the IHRA Side Impact Working Group (SI-WG) Report (Attachment 1), and presented the draft SI-WG Terms of Reference for the Committee to review (Attachment 1.1). The following changes were made for item #5 to read as "Monitor, and as appropriate provide input to the development of World SID and any other harmonized side impact dummy." The Committee approved the Terms of Reference as amended. Opinions were voiced whether testing by governments

and ISO could be coordinated successfully to avoid repeating concerns similarly raised in frontal testing. SI-WG members are coordinating with
ISO Task Force to increase their awareness of Governments' perspective. The IHRA Biomechanics Working Group (Bio-WG) will set the criteria and the biomechanical performance corridors for the future World SID design, and ISO will be responsible for development & delivery.

Mr. Owings briefly discussed the Bio-WG report. NHTSA is considering arranging a briefing to discuss the commonalities and show the interrelationships between
Bio-WG, Industry, and Government research. This effort would include, ISO, SI-WG, Bio-WG, EUROSID updates, and the future of World SID. (Attachment 2)

Working Group Status Reports:
Steering Committee members with leadership responsibilities in IHRA Working Groups presented their Status Reports, as follows:

Advanced Frontal Crash Protection - Mr. Claudio Lomonaco expressed difficulty with the Working Group's progress due to disparities in development of performance criteria. Mr. Dominique Cesari suggested a closer examination of current crash data for help in focusing the research and decision making of angles of impact, percent of overlap of vehicle, mass, speed, etc. Mr. Lomonaco asked the Bio-WG to offer assistance. (Attachment 3)

Vehicle Compatibility - Mr. John Jeyes presented, Committee accepted. (Attachment 4)

Intelligent Transportation Systems (ITS) - Mr. Brian Jonah presented and led discussion regarding ITS equipment/technology being introduced by industry which can be difficult to obtain. The issue of liability remains a concern. Mr. Bernd Friedel mentioned two ITS projects he is currently petitioning his government to fund, and asked for interested collaborators to contact him. The IHRA Intelligent Transportation Systems Working Group (ITS-WG) identified sixteen priority projects and selected 8 as high priority. Mr. Jonah emphasized the need for funding from member countries of IHRA. (Attachment 5)

Pedestrian Safety - Mr. Yoshiyuki Mizuno presented, Committee accepted. (Attachment 6)

IHRA Web Site:
The Committee agreed to post accepted Status Reports on the IHRA Web Site. IHRA Working Group Chairpersons will have access to a private "chat room" to talk with Steering Committee members. Additionally, it was agreed to have biographies of Steering Committee members placed on the Web Site, however, members agreed flags of participating countries will not be posted on the Web Site. (Attachment 7)

DG Letter & OICA Proposal:
Ms. Viola Groebner agreed to try to get a response from the DG 13, on the letter sent by the committee. They discussed the OICA request to form a new IHRA working group on "Data Collection," and agreed current resources are stressed to the limit, and IHRA at this time should not expand in this area of research. Mr. Owings said he would relay this decision back to OICA possibly

to use other existing fora more appropriately to handle this effort. Additionally, Mr. Owings agreed to follow-up with OICA officials regarding their nominee for its ITS-WG, since no nominations have been received for the ITS-WG.

New Business:

1) Mr. Owings, posed the following question to the Committee; After 60% completion toward our 5-year plan, what midterm corrections should the committee be considering? The Committee agreed to consider this question in collaboration with their respective government officials and present their views at the next Steering Committee meeting. The Committee agreed that IHRA must be vigilant, but careful in bridging the connection between research and regulations. They suggested, when appropriate, IHRA would initiate a report to WP 29 for referral to government regulators for drafting regulation that would then return to WP 29 for possible global regulations.

2) Mr. Yoshiyuki Mizuno and Mr. Kazuhiko Morisaki distributed a two-page statement representing Japan's view of IHRA Activities (Attachment 8). The statement asks for the IHRA Chairman to respond. The Chairman will respond after consultation with all Steering Committee members.

Next Meeting:

The Committee agreed to continue to meet during the week of every other WP 29 meeting held on Thursday afternoons. The next Steering Committee meeting will be on March 9, 2000, at the US Mission. The IHRA Secretariat will coordinate arrangements.

Meeting adjourned 18.05.

Prepared by: Ms. Donna E. Gilmore, IHRA Secretariat (Alternate), Note: Electronic file of meeting minutes was inadvertently corrupted. Minutes were reconstructed from hand written notes taken at the meeting.

Date: July 15, 1999
End of Report

Attachments: 1-8

Attachment 1

DRAFT PROGRESS REPORT

INTERNATIONAL HARMONISED RESEARCH ACTIVITIES
SIDE IMPACT WORKING GROUP

JUNE 1999

Introduction

The IHRA Side Impact working Group (SIWG) held its 4th meeting on 17/18 May 1999 in Kyoto, Japan. During the previous week, meetings of the IHRA Biomechanics Working Group (BWG) and WorldSID Task Force were also held. The work of these three groups is closely linked and there has been a great deal of cooperation between them.

Progress of Side Impact Test Procedure

Members confirmed that the accident data indicated that the IHRA side impact test procedure should consist of the following:

1. Moving deformable barrier crash test
2. Vehicle to pole crash test
3. Out of position static test(s) for side airbags

Members also confirmed that, based on the information from accident studies and preliminary testing, two sizes of side impact test devices (50%ile male and 5%ile female) are needed to be available for use in the test procedures.

Attachment 1 is a draft containing details of the proposed test procedures that need to be finalised by way of research tests within the next 12 – 18 months. This is based on available real-world crash data provided by the regions to both the SIWG and BWG and summarised by Transport Canada.

The Federal Office of Road Safety of Australia and Transport Canada are already involved in a cooperative project to examine the parameters of mass, stiffness and geometry of the moving deformable barrier on injury outcome. This will assist in making decisions for the first part of the test procedure. The National Highway Traffic Safety Administration and Transport Canada have commenced a collaborative project to examine the issue of Out-of-Position assessment of

side airbags. This work will form the foundation of the third part of the proposed test procedure.

Japan has agreed to develop a research test plan within the next 2 months. The EEVC WG13 on side impact will review Attachment 1 at its next meeting in June to examine how it may best contribute to the IHRA work.

Progress of Test Device

The WorldSID Task Force meeting finalised the specifications for the development of a 50%ile male WorldSID α-prototype. It is expected that the α-prototype will be ready for initial evaluation to biofidelity requirements by July 2000.

The β-prototype is expected to be available for evaluation by the beginning of 2002. The release of the production 50%ile male WorldSID is scheduled for the beginning of 2005.

The primary focus of the WorldSID Task Force's funding and development resources are on the 50%ile male test device. The addition of a 5%ile female test device will have timing and resource implications.

However, the WorldSID design team believe they can have a 5%ile female production ready version available by the beginning of 2006 if given a clear mandate for development before the fourth quarter of 1999.

Timeframe for Developing a Globally Harmonised Test Procedure

While it is not the task of the IHRA Working Groups to develop legislative regulations, the following may be useful to provide governments with an indication of the time necessary to implement a regulation based on the test procedures being drafted by IHRA. There are two options which essentially define the shortest and longest timeframes within which a globally harmonised side impact test procedure could be developed.

To achieve the shortest timeframe would require the test procedure drafted by the SIWG (for 2001 ESV) to be evaluated in parallel with the test device. This would mean that vehicle manufacturers would have both a finalised 50%ile test device and test procedure by the beginning of 2005. This would extend out to the beginning of 2006 when the 5%ile female is included in the test procedure.

It is also assumed that administrative arrangements to legislate the regulation are also done in parallel. Given 2 – 3 years lead time to vehicle manufacturers, the shortest effective date for a new regulation would seem to be around 2008.

The longest timeframe will result from the evaluation of the draft test procedure not beginning until the test devices have been finalised. Given a 2 year evaluation period and 2 – 3 year lead time, a new regulation would not become effective until after 2010.

The draft timelines for the work of the IHRA SIWG and BWG and the WorldSID Task Force are at Attachment 2.

Summary

The IHRA side impact test procedure is expected to consist of the following:

Moving deformable barrier crash test
Vehicle to pole crash test
Out of position static test(s) for side airbags

Two sizes of WorldSID test devices (50%ile male and 5%ile female) need to be available for use in the test procedures.

The evaluation of the test devices and the test procedure should be conducted in parallel to ensure that WorldSID is able to evaluate the requirements of the draft test procedure. This will enable governments worldwide to consider the implementation of a globally harmonised side impact regulation in the shortest possible timeframe.

All stakeholders must commit sufficient resources for this parallel evaluation program in Point 3 to proceed.

Future Meetings

Date	Place	Comments
15 July 1999	Berlin	Following IHRA BWG (12 Jul 99) and WorldSID Task Force (13/14 Jul 99). To develop a test matrix involving all regions.
3/4 November 1999	San Diego (after Stapp Car Crash Conference)	Following IHRA BWG (27 Oct 99) and WorldSID Task Force (1 Nov 99)

Keith Seyer
Chair
7 June 1999

Attachment 1.1

IHRA SIDE IMPACT WORKING GROUP: DRAFT TERMS OF REFERENCE

Co-ordinate research worldwide to support the development of future side impact test procedure(s) to maximise harmonisation with the objective of enhancing safety in real world side crashes. This would include:

1. Review of real world crash data to prioritise injury mechanisms and identify associated crash conditions taking into account likely future trends.

2. Taking into account the need to protect both front seat and rear seat(s) adult and child occupants.

3. Interaction with the IHRA Biomechanics Working Group to monitor the development of harmonised injury criteria.

4. Interaction with the IHRA offset frontal and vehicle compatibility working groups to ensure solutions in one area do not degrade safety in another.

5. ~~Monitor the development of a worldwide harmonised side impact dummy.~~ The following changes were made for item #5 to read as "Monitor, and as appropriate provide input to the development of World SID and any other harmonized side impact dummy."

6. Possible additional component or subsystem test procedure(s).

Target date for draft proposal of test procedure(s) is 2001 ESV.

Attachment 2

International Harmonized Research Activities

Status Report

of the

Biomechanics Working Group

Rolf H. Eppinger, Chairman

June 16, 1999

Charge:

At the last International Technical Conference on the Enhanced Safety of Vehicles, the International Harmonized Research Activities (IHRA) Steering Committee directed the Biomechanics Working Group (BWG) to form a Government only ad hoc group to determine the specifications for a universal side impact Anthropomorphic Test Device (ATD) taking into account the following items:

1. Analyze the safety problem in side crashes and quantify the fatalities and injuries to different body regions in real world side crashes, prioritizing the current problem.

2. Analyze the human injury data obtained through biomechanics research, impact injury research and testing, Crash Injury Research and Engineering Network (CIREN) data, and other data to determine the injury mechanism in side crashes and establish injury risk functions and develop all meaningful injury criteria to address the safety problem identified in item 1.

3. Review all available biofidelity test results according to their relevance to real world, in-vehicle environment and establish their validity.

4. Examine all available side impact ATDs with regard to their biofidelity and injury risk assessment capabilities for the criteria developed in item 2.

5. Make recommendations on the most suitable dummy, if any, suggest modifications to those devices which are promising, and establish a realistic time frame in which

such devices may become available.

6. The ad hoc group is required to prepare and interim report on the status of its activities described in items 1 through 5 for presentation to the IHRA Steering Committee in an meeting scheduled for November 1998. It is the intent of the Steering Committee that the ad hoc group complete its work in the shortest possible time, draft a report, and provide it to the committee, no later that November, 1999.

Membership:

The membership of the Biomechanics Working Group (BWG) consists of 6 governmental representative and 3 industrial representatives. The current membership is:

Rolf Eppinger, BWG Chairman - NHTSA, USA.
Dominique Cesari, EEVC Representative.
Dainius Dalmotas, Transport Canada, Canada.
Koshiro Ono, JARI, Japan.
Keith Seyer, FORS, Australia.
Jac Wismans, EEVC Representative.
Toru Kiuchi, Toyota, Industrial Representative from Asia/Pacific.
Bud Mertz, GM, Industrial Representative from North America.
Farid Bandjellal, Renault, Industrial Representative from Europe

While the full BWG membership and other invited experts are participating in the ad hoc side impact dummy task, the formal, Government only ad hoc group consists of the first 6 members listed above.

Activities to Date:

Meetings:

The Biomechanics Working Group has met three times since the 16th International Technical Conference was held in Windsor, Canada from May 31st to June 4th. These meetings were held in Goteborg, Sweden on September 18, 1998 in conjunction with the IRCOBI conference, in Tempe, Arizona on November 5, 1998 in conjunction with the Stapp Conference, and in Kyoto, Japan on May 14, 1999 in conjunction with safety related ISO activities.

Assignments:

Because of the comprehensiveness of the assignment and the shortness of the IHRA

Steering Committee's proposed schedule, the BWG decided to concentrate the majority of its efforts on completing its ad hoc assignment of determining the specifications for a universal side impact ATD. Therefore, individual members have agreed to head up group efforts responsible for completing the various assigned tasks. These include: Anthropometric definition of the world population - Keith Seyer; Analysis of world side impact crash and injury characteristics - Dainius Dalmotas; Biomechanical impact response definitions - Rolf Eppinger; Dummy impact response evaluation - Jac Wismans: and Injury criteria and risk functions - Dominique Cesari. Since considerable effort has been devoted to these subjects by various ISO Committees, it was decided that wherever possible, the BWG would use the ISO documents as the basis from which to begin its efforts and/or base its conclusions.

Progress To Date:

While efforts in each of the assigned areas are currently underway, the BWG has not reached any definitive conclusions or results at this juncture. However, a general status for each of the efforts can be offered.

Anthropometry - Several anthropometric studies do exist that will allow consideration of the world population at risk and its impact on the size, shape, and weight of the various current side impact dummies. Using the studies related to anthropometry of occupants seated in vehicles, the BWG is also examining the changes necessary to dummies to accurately depict seated occupants.

Crash Data Analysis and Injury Characterization - Crash data from each of the world's major geographical areas has been obtained and is being analyzed. Of specific interest is whether any unique injury patterns exist within the various geographical areas. Preliminary results indicate that generally, the side crash injury patterns are similar and that only minor additions may be necessary to address world wide injury problems related to side crashes..

Biomechanical Impact Response Definitions - Desirable dummy impact response characteristics have been developed by the ISO and are documented in ISO Report 9790. Using this document as the starting point, the BWG is examining the need for any revisions to these characteristics. Since a considerable amount of new impact response data is available, it is considered possible to simplify the recommended dummy impact response characterizations currently specified by ISO. This new data has been distributed to the members of the BWG and efforts are underway to develop future dummy specifications.

Dummy Impact Response Evaluation - The proposed ISO dummy evaluation plan is being modified by the BWG. When completed, the data from the evaluation will be analyzed and recommendations on the appropriateness of current dummies will

be offered.

Injury Criteria and Risk Functions - A review of existing literature concerning injury criteria and risk functions for side impact injuries is currently underway. Several body areas, such and the neck and thorax, have a variety of competing criteria available. While it is the intent of the BWG to make a recommendation on what it believes would be the most appropriate injury criteria and risk functions, it will also make general instrumentation recommendations that will require measurement of several parameters to allow the flexibility of assessing injury risk using a variety of different injury criteria.

Interaction with other Side Dummy Efforts:

The BWG is monitoring the current WorldSID development activities. The WorldSID team has expressed their willingness to incorporate as much of the IHRA BWG recommendations into their design as is possible within their established development schedules. To take advantage of this opportunity, members of the BWG have been invited and have participated in WorldSID meetings. The WorldSID team members have also been invited to participate in BWG activities. This cooperation allows BWG members to better understand the current bases of the WorldSID specifications and how they could possibly be improved. It also allows the WorldSID team to have access to the thinking of the BWG. Without directions to the contrary from the Steering Committee, the BWG will continue to maintain this open channel of information interchange.

Other Activities:

While the majority of the BWG's activities are concerned with the Side Impact Effort, the Working Group has discussed extending its activities to other areas. Of particular interest was an effort to address the biomechanical response specifications and injury criteria/risk functions for an advanced frontal dummy. The individual efforts would mirror the tasks identified in the current side impact effort with the hope that these efforts would evolve into a single, world-wide accepted, family of frontal test dummies.

Attachment 3

Roma, 14/5/99

To: -Dr. Tom Hollowell +1 202 366 5930
-Dr. Dainius Dalmotas +1 613 998 4831
-Mr. Yoshiji Kadotani +81 28 677 7230
-Dr. Kazuo Oki +81 565 23 57 58
-Mr. Keith Seyer +61 6274 7477
-Mr. Tadeusz Diupero +48 22 116028
-Mr. Richard Lowne +44 1344 770645
-Mr. Herbert Hennsler +32 2 2969637
-Mr. John Hinch +1 202 366 5930
-Mr. Adrian Hobbs +44 1344 770915
-Mr.George Neat +1 617 4943064
-Mr. Anders Lie +46 24375480
-Mr. Paul Fay +44 1268 703747
-Dr. Guy Nusholtz +1 248 570 7936
-Ms. Donna Gilmore +1 202 366 5930

IHRA Working Group on Advanced Offset Frontal Crash Protection.

Please find here enclosed the minutes of the fourth meeting of the Working Group, held in London on 16-17th February 99.

Sincerely yours,

Claudio Lomonaco

INTERNATIONAL HARMONIZED RESEARCH AGENDA (I.H.R.A.)

Rome, 15/3/99

STATUS REPORT ON THE ADVANCED OFFSET FRONTAL CRASH PROTECTION GROUP (Based on the results of the meeting held in London on 16-17 February 1999)

Participants: C. Lomonaco (Chairman, Ministry of Transport of Italy), R. Lowne (EEVC), A. Lie (EEVC), K. Seyer (Federal Office of Road Safety Australia), A Hobbs (IHRA Compatibility), P O'Reilly (IHRA, Compatibility), T. Hollowell (NHTSA), C. Newland (IHRA, Side Impact), Y. Kadotani (JAMA), G. Nusholtz (OICA), P. Fay (ACEA/OICA), E. Gianotti (Secretary of the Group).

INTRODUCTION

The chairman, after welcoming the participants, gave a brief résumé of the contents of the past meeting and asked for comments concerning documents AFC13 and 14 distributed by NHTSA at the last session.

NHTSA announced that it is setting more complex and stringent biomechanical criteria, such as combined thoracic index and neck criteria.
Comments on the NPR have being received by NHTSA from different participants on this issue, such as, Insurance Companies and Auto makers particularly regarding the combined new criteria. A status report on conclusions of these discussions will be published by mid-march.

Explaining briefly the document AFC13, NHTSA reported the experience of the agency with respect to possible procedures and the lead time expected to finalize the research. Compatibility is being taken into consideration. The commitment is to design a new procedure that should match not only present vehicles but also the new generation ones. The new procedure will be introduced in the future.
In conclusion NHTSA said that Mobile Deformable Barrier, both left and right offset, would address the largest vehicle population with injured drivers. The full fixed barrier test would address a lower target population. All other potential tests, such as the Offset-Barrier EU Test, would address significantly lower target population.

Asked about the European views on the performance criteria and test procedure documents, the representative of EEVC suggested that the IHRA Biomechanics working group be asked for their advice about any progress on new criteria for frontal crash protection, taking into account the fact that the members of the frontal impact group were not experts in this specific topic.
Furthermore Mr. Lowne remarked that the goal of a potential candidate test procedure is to reduce the casualties and not to reproduce the most frequent accidents.
Mr. Hobbs added that it must be clear that the test method influences car design. Accordingly a proper method has to be devised to achieve a car design corresponding to the goals that we are focusing.

Conclusion

According to doc. AFC-15, from Japan, further test using vehicles with different weights at varied collision speeds and other factor than the collision speed are awaited.

DISCUSSION ON THE AGENDA OF THE MEETING

1. Extension to vehicle of category N1 (1st step)

OICA

Was invited last meeting to collect data from the market to define N1 subgroups.
OICA briefly presented some slides showing this categorization:
M1 2,5 - 3,5t include Minivan, Sport Utility Vehicles.
N1 1,3 - 1,4t / 2,3 - 3,5t
Other N1 vehicles

- ◆ Non integral
- ◆ Multi stage built

Mr. Fay pointed out also that the structural differences between vehicles heavier and lighter than 3,5t consisted in the fact that for vehicle until 3,5t the monocock construction is most used, when over that weight the frame construction prevails. He believed that the application of the offset deformable frontal impact test to N1 car-derivatives, which would be N1 vehicles up to about 2 tonnes, should present no problems. Panel vans above this mass may present problems.

EEVC

After reviewing former document AFC 16, concerning overviews on the issue of extension to vehicle of category N1, EEVC presented document IHRA AFC-18. The report concerning, frontal impacts impacts, is sub section of an accident analysis for the review of the Frontal and Side Impact Directives on behalf of BASt, TNO, TRL, Volvo. The aim of this part was to consider these technical issues:

- Test speed
- The neck injury criteria
- The extension to N1 vehicles

From the review of accident data, sufficient evidence was found to suggest that neck injury criteria should be retained, an increase in the test speed should be considered and that N1 class vehicles be included in the test. In this study it is noted that relative to the total number passenger, the percentage of N1 vehicles increasing. The percentage of kilo
metres driven by the N1 class vehicle is also increasing.
From the presented data it can be seen that on average N1 class vehicle appears to be less lethal to their occupants than a passenger car (M1), but N1 class appears more aggressive than M1.
From the findings of the survey, the possible aggressive nature of N1 vehicles has been highlighted.

USA

Vehicles are categorised rather differently in the USA, being distinguished primarily by weight, with categories including “passenger car” and “light truck”

Conclusion

The Chairman requested that further analyses should be made (especially from different markets such as Australia and Japan) to implement the studies conducted so far.
The chairman also insisted about the developments of the barrier in relation to the new method and to the extension of vehicles of category N1.

2. Type of barrier

NHTSA

An overview of the NHTSA commitments in carrying out new tests, a new test to improve understanding of Frontal Crash Protection with regard Passenger Cars vs. LTV, is given in doc. AFC 17

The Agency remarked that the test to reproduce the effect of a MDB test should get a procedure as simpler as possible. If such goal will be not achieved, NHTSA will adopt an FDB test.

The priorities of the Agency are to reduce:

1 Intrusion (induced injuries)

2 Deceleration (based injuries)

Mr. Hollowell clarified that in the case of the MDB test , it should be basically divided in two test concerning the overlap:

1. Stiff crash pulse intrusion (more overlap)
2. Soft crash pulse intrusion (less overlap)

Australia

The delegate presented document IHRA AFC 19. The document was related to the vehicle size and to the barrier frontal height. Accordingly in the document the vehicles were divided into three groups; Small, Medium and Large. For the design of an impact barrier, the most important of the measured frontal members were the upper dimension of the top and the lower dimension of the bottom crossmember, because they determine the height and ground clearance of the barrier.

Differences found between vehicles suggested that nose-dive was related to braking deceleration and suspension characteristics of the individual vehicle. Vehicle mass was not significant in its own right.

EEVC

Reported that EEVC WG.16 was not considering the revision of the existing fixed barrier design. The prominent issue being considered by the group is a different mass of a mobile barrier with respect to those of the vehicles under tests.

This group has addressed their researches to:

- Practicability aspects (same masses for impact tests).
- Same mass with regard to that of a certain category of vehicle.
- Geometry is not considered.

The provisional conclusion was that the barrier mass should be the same for all cars tested, but that the subject was complicated and more research was needed.

Chairman

Suggested to revise the former table concerning the Trolley-based Frontal Offset Impact Test procedure, which after a brief discussion was changed as follows:

ADVANTAGES	**ALTERNATIVE APPROACH TO ACHIEVE SAME ADVANTAGE WITH FIXED BARRIER**
1. The acceleration pulse, DV and energy distribution is representative of real world serious injuries.	No known alternative.
2. Takes into account the effects of the Mass Ratio of the vehicles.	Change impact speed with vehicle mass.
3. Can include angular effects on the deformation and intrusion characteristics.	No known alternative.
4. Can include a possible measure of Compatibility (by, for	Measure the force on the fixed barrier behind the

instance, measuring the vehicle and/or trolley acceleration)	deformable face.
Disadvantages	**POSSIBLE ACTIONS TO REDUCE THE DISADVANTAGE**
1. Complex test procedure for "moving barrier-moving car" (such as high speed trolley bounce. Possible overriding and others).	Reduce complexity by testing co-linearly and/or using moving barrier to stationary car. Explore methods of reducing artificial overriding.
2. Repeatability of more complex test may be poor (for angled moving barrier-moving car)	
3. Difficulties to video record impact effects between trolley and stationary car.	Mount the camera on the vehicle
4. Limited number of test laboratories with capability to perform trolley-to-vehicle testing.	Minimise the complexity of the test and/or improve capability of test institutes.
5. Unknown ground and other interaction effects, especially if one vehicle stationary while the other travels at higher speed – to represent both vehicles moving.	Investigate
6. Need to agree on a harmonised barrier mass, stiffness and geometry when vehicle fleet differ internationally.	Agree to differ

Conclusion

The chairman recommended that for type approval a simple procedure should be finalised and noted the suggestion of Mr. Lowne, who pointed out the need to consider the importance of the effects of

- collision angle (repeatability problems)
- mass
- compatibility

Furthermore the concern of Mr. Hobbs, regarding the difficulties to separate the definition of a new method from those of compatibility and biomechanic, was addressed to the group.

9. Impact speed

EEVC

With reference to doc. IHRA AFC 18, Mr. Lowne reported the results of the survey concerning this matter to the group. The study indicates that frontal impact test speed may need to be increased, in order to address frontal impact protection up to the severity which a reasonable proportion (approximately 50%) of seriously injured occupants are currently subjected. However, raising the test speed might lead to increase the vehicle's overall frontal stiffness. Accordingly injuries caused by higher deceleration could be envisaged. Therefore the accident data were split into those related to acceleration and those related to contact. The results for all samples showed that the contact injuries predominated, suggesting that an a higher test speed that resulted in a small increase in acceleration would be beneficial overall.

Furthermore, Mr. Lowne emphasised that the indicated speed of 64km/h is a test speed and not an accident velocity.

10. Performance Criteria

NHTSA

Mr. Hollowell presented document IHRA AFC 20, concerning performance criteria.

In response to the Congress Directive, to conduct a feasibility study toward establishing a FMVSS for frontal offset crash testing, a series of crash tests was performed. In the test series, all dummies 5th percentile and 50th percentile were tested with and without the safety belt systems. Three model years were used during the tests. Currently NHTSA is writing a report to the Congress .

Hobbs

Remarked the different approach of USA and Europe to the problem. USA looks at the severity oif the test method based on the dummy responses, while EU is focusing on how the method tests the car structural performance. Such differences should be taken into account in the definition of a new method.

EEVC

Suggested that this working group should identify the body areas for which performance criteria were required and ask the IHRA Biomechanics group and EEVC WG12 for advice on the performance criteria

Australia

Pointed out that currently the biomechanics group is concentrating on lateral impact studies.

Conclusion

According to Mr. Lowne and Mr. Hollowell a list of the body regions statistically most frequently seriously injured should be created with the aim of asking opinion of the experts how to assess them and which is the best test tool to use. Mr. Lowne will circulate within the group a complete list concerning the following topics:

ITEMS	TOOLS	CURRENT METHODS
HEAD	Head acceleration	HIC + Peak of acceleration
FACE	Force and pressure	No criteria
NECK	Pressure and forces	
UPPER LIMBS	Forces, moments, Angular and linear acceleration	
CHEST	Acceleration, compression, velocity of compression,	
THORACIC SPINE	Forces moment and acceleration	
ABDOMEN	Pressure, compression, velocity of compression.	
LUMBAR SPINE	Angular displacement, forces, moments and acceleration.	
PELVIS/FEMUR/KNEE	Forces, compression, shear (pelvis accel.)	
LOWER LEG	Forces axial/shear, moment	
FOOT ANKLE	Acceleration: load, moment angle.	

Mr. Hobbs

Presented the proposal, developed by EEVC WG16 for the measurement of footwell intrusion and that will be assessed for use within EU-NCAP.

The intrusion of the brake pedal is measured with respect to a reference line passing through the pedal and inclined of 56°. This first geometric approach will be implemented for data collected during the next NCAP tests and it will be possibly modified.

5. Air-Bag performance

NHTSA

The delegate from NHTSA informed about the tests conducted to investigate about the trauma induced when the vehicle occupant is in close proximity to the deploying airbag.

The data collected from these tests suggest that the new Combined Thorax Index (CTI) is a good discriminator between more aggressive and less aggressive air bags.

The tests were conducted in comparing vehicles equipped with air-bag pre 1998 and 1998. The results showed that all the 1998 air-bags appeared less aggressive to the chest than the corresponding pre-1998 air bags.

Other tests concerning out of position were conducted to investigate the trauma induced when the child dummy is in close proximity to the deploying airbag.
Baseline tests were conducted with original airbag inflators while corresponding depowered tests were conducted using the same airbag module, but with some propellent removed from the inflator.
This decrease in aggressivity is correlated with a decrease in the proposed thoracic injury criteria, suggesting that these criteria predict injury risk for children reasonably well.
Other topics concerning airbag and related performance criteria are included into document AFC 14.
Furthermore, answering the question of the chairman concerning the 5th percentile female dummy, NHTSA stated that the agency is concerned about a test velocity of 40 km/h as a first step. Regarding the dummy, the agency is still evaluating pros and cons.

EEVC
As far as the European regulatory conditions are concerned, EEVC saw the maximum benefit from using the 50th percentile dummy for the first step.
For a second test, according to NHTSA suggestions, EEVC will enquiry for feasibility and opportunity to do use the 5th percentile

OICA
Remarked once more the differences between Europe and USA, because the Air-Bag has been introduced in Europe in a second step for restrained occupants. In most of all the US cases the Air-Bag system is set to protect the unrestrained occupant. This different philosophy has led to much more powerful Air-Bag in USA and less powerful in Europe.
Moreover the delegate of the industry suggested that the adoption of 5th percentile female test would not lower the aggressivity of the Air-Bag, but simply change the threshold of firing. An Air-Bag fitted for a 5th percentile female can not necessarily be safe for other category of occupants.

Chairman
Reminded that statistic on injuries induced by the Air-bag are available. On this base, an European approach on the Air-Bag performance should be advisable.

6. Impact angle

NHTSA
According to paper IHRA AFC 13, the MDB test is devoted to assess severe oblique real crash accident with significant intrusion and frontal engagement. Tests led by NHTSA, demonstrated that this methodology produces significant intrusion in smaller and lighter vehicles. The suggested angle of entry of the trolley has been reduced to 20°, based on the discussions within this wg.
Anyway, the agency announced that the next papers from NHTSA will regard the level of overlap, the level of angle influence, displacement of the dummy and impact of this last with the Air-Bag.

7. Conclusion of the meeting

Point 7 and 8 were already involved and examined into the discussion.
The date of the next meeting was roughly scheduled for July 1999.

LIST OF CLASSIFIED DOCUMENTS

- **IHRA/AFC-13 Review of Potential Test Procedures for FMVSS No. 208 (S. Stucki, W.T. Hollowell, H.C.Gabler, S. Summers, J.R.Hackney)**
- **IHRA/AFC-14 Development of Improved Injury Criteria for the Assessment of Advanced Automotive Restraint Systems (M.Kleinberger, E.Sun, R. Eppinger, S.Kuppa, R.Saul).**
- **IHRA/AFC-15 Real Conditions of Japanese Road Traffic and Traffic Accident (K. Oki)**
- **IHRA/AFC-16 UN and EU Vehicle Category Definitions**
- **IHRA/AFC-17 Improved Frontal Crash Protection: Passenger Cars and LTV'S**
- **IHRA/AFC-18 Accident Analyses for the Review of the Frontal and Side Impact Directives**
- **IHRA/AFC-19 Australia study on vehicle Nose-Dive.**
- **IHRA/AFC-20 Frontal Offset Crash Test Study Using the 50^{th} Percentile Male and 5^{th} Percentile Female Dummies**
- **IHRA/AFC-21 Deflection Characteristics of EEVC and ADAC Frontal impact Barriers**

Attachment4

15/6/99

INTERNATIONAL HARMONISATION OF RESEARCH ACTIVITIES - COMPATIBILITY WORKING GROUP

Chairman's Status Report for IHRA Steering Committee on 24 June 1999

Nominations and Attendance

Industry have been represented from the fourth meeting and at the last (fifth) meeting there was a full complement of three industry delegates i.e. Japan and Europe and, for the first time, the USA.

At the fifth meeting in London on 18-19 February 1999, an Australian government delegate attended for the first time. The IHRA front and side impact groups were also represented for the first time with the chairmen and others attending. Poland is the only country which has not yet sent a delegate to any meetings.

Co-operation with EEVC WG15

The longer established EEVC WG 15 was formed in February 1996. Representatives from NHTSA and European industry attend WG 15. Currently the chairman of the IHRA group attends EEVC meetings where the organisation and timing of the IHRA and EEVC meetings are linked. This trial linking, with a common session for technical presentations, has proved very beneficial in the third and fourth sessions and will again be the format for the coming sixth session in early July.

Linking with other IHRA groups

The same benefits in saving travel and promoting awareness also apply within IHRA. When the fifth meeting was held in London, the UK government DETR also hosted the IHRA front and side impact meetings adjacent to the compatibility meeting. This did not include common sessions but allowed some cross attendance from the other IHRA groups, in particular the chairmen of the front and side impact groups.

A similar approach is being built on for the sixth session in Berlin; there the IHRA

front impact meeting will follow linked meetings of the IHRA and EEVC compatibility groups.

Other European links

Members of the IHRA group were amoung those invited to a joint EUCAR and EEVC workshop (accident analysis on the subject of compatibility) organised on 8-9 February 1999 by Dr Zobel who heads the European industry EUCAR project on compatibility.

Links for next meeting

The seventh meeting could be held at the time of the Stapp conference (28/29 October 1999).

Overview of Member's Positions

The USA continues to have the most extensive plans for compatibility research. The approach taken is based on studying accident statistics to determine the extent of incompatibility in the US vehicle fleet, using computer modelling techniques to characterise and represent the demographics of the fleet, the pattern of accidents and to investigate the areas where changes to test procedures could have the best effect on casualty rates.

At the last meeting NHTSA presented updated data on aggressivity in the fleet . A disproportionately high risk of fatalities in LTV (light trucks and vans) to car front and side impacts occurred in the car occupants. SUV data was now grouped by size showing large SUVs to be more aggressive than small SUVs. A further analysis was restricted to vehicles which were produced after 1990 as these offer improved crashworthiness. This has shown an improvement (lower risk of death) in all types but the relative variation with respect to the type of vehicle was similar to that found for all ages of vehicle; this suggests that the aggressivity of LTVs will persist in future fleets. A comparison of LTVs and car characteristics linked their greater aggressivity to a number of reasons including their greater mass, stiffer structure and higher ride height. Analyses of load cell wall data, from US NCAP tests was also presented. This was used to assess the stiffness and geometric characteristics of vehicles and aggressivity metrics were suggested for frontal offset and frontal oblique impacts with additional metrics suggested for side impact linked to forces at sill height and encouraging a lower proportion of forces in the upper load cells to limit intrusion .

The EEVC WG 15 work is partly funded by the European Commission, the Commission project lasting from July 1997 for 2 years followed by a reporting phase. Many groups are involved in the work and only those responsible for the individual packages are indicated. The work to date includes a literature review, accident analysis both drawing on in-depth studies and general accident data to try to quantify the incompatibility problems. This is interlinked with a structural survey to create a data base of the geometrical properties of new car models on the European market. The modelling work includes the use of Madymo models developed from FE models provided by NHTSA.

At the last meeting, the chairman of the EEVC WG15 described the EEVC work programme. This included an update on the TNO MADYMO models of the Taurus and Neon. TRL is supplementing this with FE validation runs.

The EEVC vehicle test programme is underway and the front tests are being carried out by BASt, Fiat, INRETS and TRL and the side by INSIA. Briefly the front impact tests cover car to car (50% overlap, 56 kph), car to OBD (40% overlap, 64 kph), car to full width rigid barrier (56 kph) and car to full width deformable barrier (56 kph). Most of the ODB barriers are with EEVC faces but a few use ADAC faces It is proposed that a full width US NCAP type impact be carried out with a thin deformable face ahead of the load cell wall to identify non-homogeneous loading. Analysis of the interface force in car to car impacts can be compared with the load cell wall data in barrier impacts. Data from these full width tests will be compared with that from car to car and car to ODB tests. For side impact, INSIA will carry out car to car tests (50 kph) examining the effect of bullet vehicle height. For both frontal and side impact, some tests will be carried out with modified cars with more homogeneous fronts.

The European industry (EUCAR) project concentrated initially on accident studies; these have proved inconclusive with no clear statistical relationships found. Based on their accident data, they had grouped some factors as "compulsory" and others as "possible."

Crash testing of selected cars by will follow.

One concept outlined was the "bulkhead concept" combined with limiting the passenger compartment acceleration to 30 g. In theory, this could accommodate 90 percent of mass ratio impacts in European cars.

In the US industry, Ford are carrying out partial and full overlap car to LTV tests. They are concentrating on frontal impact as side impact is primarily influenced by geometry. Side airbags will play an important role in dealing with side impact compatibility problems. FE modelling is being used to support the crash test work. They are also looking at 30 degree offset car to car tests similar to those carried out by NHTSA but will be using a lower speed (60 mph). They are also looking at accident data, in the light of concerns that delta v assessments are generally

too low.

GM plans may be reported on in a future meeting, possibly via the NHTSA delegate, pending the result of changes in the AAMA.

At the last meeting, Japan explained that J 208 has been expanded to cover minicars (approx. 800 kg) with a speed increased from 40 to 50 km/h. Some 50 km/h, 50 percent overlap car to car tests are being carried out. At the next meeting, some accident data on minicars could be presented. This should augment earlier data on the Japanese fleet and overall accident statistics.

Australian data from a survey of the structures of six cars of different sizes has been presented. The positions of the frontal cross beams and longitudinals were recorded in the static and braking situation. Vehicle mass was not significant in its own right in the vehicles examined. The data was also shown in relation to sill height.

An analysis of both injury and fatal crashes, to examine the relative risks in frontal and side impacts to occupants in vehicles of various sizes, is being prepared by Australia. Currently, accident studies are showing that there is a strong correlation with mass in frontal impact. In side impact, risk is associated with car size. The greatest risk is seen in small cars.

A test matrix for five side impact tests is being carried out. For the future, a frontal impact compatibility programme will be planned drawing on the findings of the accident analysis.

Canada has no specific compatibility programme but consider that their side impact work may provide useful information. Accidents are being examined to find cases of low injury severity in severe impacts and AIS 3+ injuries in minor impacts and the implications for the side impact test. They are also looking at side impact airbags.

It is expected that the Canadian research over the next year or two will concentrate on side impact. However, as the IHRA compatibility work progresses, they will look at the proposals.

Canada has previously reported that LTVs were a growing part of the Canadian fleet and that more detailed accident analysis will be possible as vehicle identification data (VIN) becomes accessible in their national data set.

Prospects for Harmonisation

It was always envisaged that the working group would look initially at the effects of compatibility in the car field, but always making sure that any conclusions took account of the effects on other types of vehicle. However there is a clear difference in the mixture of vehicle types in use in North America compared with Europe and

Japan. There may also be differences when Australia is studied more fully. In particular, the high incidence of LTVs in the US and Canada has relevance to compatibility. This variation in car fleets has required the IHRA group to consider a wider group of vehicles than was originally planned in the EEVC WG 15 work for Europe.

Some of the FE car models created by NHTSA relate to cars on sale in Europe and this is of use to the EEVC modelling work led by TNO.

Representatives have been encouraged to think about the shape of possible testing methods so that this can help form views on current efforts and plans, while much of the research work is in the earlier stages.

Conclusion

Progress has been made on the early stages and the range of modelling and crash testing results available should widen considerably by late 1999.

Finding common methods to evaluate and control compatibility which could confidently deliver quantifiable casualty reductions in different continents remains a complex task. Much remains to be done and it is not likely that a definitive solution is achievable around 2000. But it remains possible that a worthwhile interim method may be identified.

In future, possible avenues may include: better geometric alignment and more homogenous energy absorbing structures, control of dynamic crush characteristics to keep the occupant cell within tolerable limits over a reasonable range of mass ratios; and, in the case of side impacts, ensuring a high percentage of crash forces act at sill height and limiting the degree of intrusion or the risk of head contact due to higher impacting structures.

IHRA COMPATIBILITY WORKING GROUP MEMBERS

(last update May 1999)

Note. Not all members attend the meetings.

Mr Keith Seyer (Australia)
Federal Office of Road Safety

Mr Dainius Dalmotas (Canada)
or Deborah Collard
Transport Canada

Dr Tom Hollowell (USA)
NHTSA

Mr George Neat
Volpe Center (USA)

Mr E Faerber (EEVC)
BASt

Dr D Cesari (EEVC)
INRETS

Prof. Adrian Hobbs (UK - Secretary)
Transport Research Laboratory

Mr Peter O Reilly (UK - Chairman)
DETR

Mr Kazuo Oki (Japan)
represents OICA, JAMA, Ministry of Transport

Mr Yoshiharu Kadotani
JAMA (Japan)

Mr Koji Mizuno (Japan)
Ministry of Transport

Dr R Zobel OICA
Volkswagon AG

Dr Priya Prasad OICA
Ford USA

Dr Jerzy Wicher (Poland)
Institute of Vehicles
Warsaw University of Technology

Attachment 5

International Harmonized Research Activities - Intelligent Transport Systems
Progress Report June, 1999

Activities

IHRA-ITS Safety Test & Evaluation Workshop

This two-day workshop, held in Washington DC, April 14-15, 1999, attracted over 30 participants from research organizations in the U.S., Europe and Japan. The goal of the workshop was to identify priority research needs for ITS Safety test and evaluation. Four presentations gave overviews of the current state of knowledge in evaluating direct safety, workload, behavioural adaptations and usability. Breakout focus groups used the Nominal Group Technique to discuss research needs and identify projects suitable for international collaboration. The workshop was well received - the speakers were excellent and the group dynamics conducive to open discussion and productive exchange of ideas among researchers. After consolidation, sixteen projects were elaborated and prioritized . The participants expressed interest in participating in common projects. A package of materials, including copies of presentation slides and project descriptions was produced and distributed to participants as well as to about 70 research organizations worldwide.

Working Group meeting

The WG meeting held the day following the workshop discussed future activities. The main impediment to developing a long-term plan of collaborative research is lack of funding. Hence, the best the group can do is to leverage existing research plans and to encourage communication among researchers. Two main activities were agreed, as outlined below.

Future Activities

Research Projects

Eight of the 16 projects developed during the workshop were considered high priority by the WG. These are appended hereto. It was noted that several research centers in different countries have work already underway in many of these areas. Therefore, the WG agreed to identify the research organizations active in the 8 project areas and establish communication among them with a view towards exploring networking opportunities and enhancement of current research. WG members were assigned to lead each of the eight project areas. The leaders will establish contact with all active research organizations in their topic area to determine the feasibility of instituting collaboration and information exchange. Each leader will report on prospects for collaboration by next meeting.

ITS Assessment Program.

Sweden invited WG members to participate in their initiative to develop consumer information concerning the safety of various ITS products available on the market. The current approach is very preliminary and envisions using scientists/experts to conduct the evaluation. Safety will be rated using a "star" system, not

unlike current NCAP (New Car Assessment Program). This initiative may permit further expansion of EurNCAP which is beginning to include crash avoidance tests. An expert meeting will be held in Stockholm in October, in conjunction with the next meeting of the WG, to develop a protocol for the evaluations.

Issues for Steering Committee

This working Group continues to have difficulty developing a long-term workplan. The reasons include; a lack of pre-existing research in the area, apparent limited discretion over research resources by members of WG, European research in ITS being coordinated by EC, and a lack of technical expertise within the group. Nevertheless, the WG has conducted surveys and sponsored two workshops. As a result, it is achieving recognition from other ITS groups and there is growing interest in WG activities. The WG reaffirms that collaboration in ITS research is beneficial and should be continued beyond the original 5-year program period.

WG membership.
Not all IHRA partners are represented in the WG. GFP's are requested to review WG membership.

EC Framework 5
Lack of liaison with European Commission appears to be an impediment to international collaboration in ITS research, as discussed previously. A letter is being sent to DG XIII (copies to DG III and DG VII) to introduce the IHRA-ITS WG, describe the identified need for a Harmonized Evaluation Framework, and to invite future collaboration between the IHRA-ITS WG and DGXIII in this area.
Rank Ordering of IHRA-ITS WG High Priority Projects

1. Development of a Harmonized Safety Evaluation Methodology Framework for ITS (worldwide)

2. Driver Understanding and Expectation of ITS Systems
3. Human Factors Principles Checklist for Vehicle Control Systems
4. Normative Data on Naturalistic Driving Behavior
5. Simulator Reference Test Scenarios
6. Improved Secondary Task Methodology for Evaluating Safety Effects of Driver Workload
7. Harmonization and Validation of Surrogate Safety Measures
8. Driver Learning, Retention, & Acceptance of New ITS Systems: What We Can Learn from Past Experience

Development of a Harmonized Safety Evaluation Methodology Framework for ITS (worldwide)
Objective:
The objective of this project is to develop a Harmonized Safety Evaluation Methodology Framework for in-vehicle information, control, and communication systems with respect to human performance and behaviour.

Statement of need or justification:
To complement current international efforts to develop ITS standards and operational requirements, there is a need for reliable, valid, and efficient procedures that can be used for evaluating the safety of on-board

ITS devices. At present, the results of safety research in the public domain are often not comparable due to differences in methodologies and underlying assumptions. A safety evaluation framework would facilitate the interpretation and comparison of research findings and result in a coherent accumulation of information. This expanded knowledge base would in turn provide direction for future research and development. The framework could also permit the examination of cross-cultural and regional differences.

Elaboration of the specific question to be addressed:
The evaluation framework would include specified test measures as well as the appropriate statistical methodologies to be used with them to assess the safety impact of various ITS systems. It would incorporate a variety of measures and criteria to determine direct safety effects, behavioural adaptation, workload, and usability. Standard testing conditions would be outlined (with respect to driver and driving conditions). Specific techniques for assessment would be included as well as the appropriate benchmarks or indicators of acceptable performance levels to be used with them. The framework would be based on research and updated as progress in relevant research is made.

Driver Understanding and Expectation of ITS Systems

Objective:
The goal of this project is to determine how well drivers understand ITS systems and the performance expectations they have for these systems. A second goal is to assess the safety consequences of mismatches between driver expectation and system performance.
Statement of need or justification:
Drivers have many different ITS applications available to them. They can equip their cars with ACC, navigation systems, and communication systems, among other things. Each system is designed to aid the driver in a different way and each has different operating characteristics. The picture is further complicated by the fact that for a particular type of ITS, such as ACC, system performance characteristics may vary from one vehicle/system to another. How well the driver understands the ITS application and the expectation he or she has for its performance can directly impact the safety of its use. The focus of the current project is an assessment of how well drivers understand what particular ITS applications can do.
Elaboration of the specific question to be addressed:
There is a need to assess drivers' understanding and expectations of the various ITS systems. ACC and navigation systems are two examples from current ITS technology that provide illustrative examples. We know from past research that drivers do not understand the capacities and limitations of standard cruise control very well. Driver understanding of ACC is not yet determined. We need to assess how well people are able to understand the reliability and limitations of ACC. Some ACC systems, for example, cannot reliably detect dirty, small, or stationary targets. It appears that multiple system types will be available to consumers to indicate the curve radius capability of the particular ACC system. This lack of system standardization may contribute to poor understanding and consequent safety hazards. A second example is provided by navigation systems where systems vary as to the mode and timing of information presentation to the driver. Some navigation/route finding systems may present the driver with turning directions at a different point than the driver might expect prior to a turn. These mismatches need to be identified, measured, and analyzed to prevent adverse safety effects. A better understanding of these problems could lead to design improvements in these systems.

Human Factors Principles Checklist for Vehicle Control Systems

Objective:
The purpose of this project is to develop a checklist based on human factors principles to be used in the safety evaluation of vehicle control systems.

Statement of need or justification:
Similar types of checklists are already available and have proven useful in other applications such as the evaluation of information systems. The value of this type of approach is that it provides a relatively quick, prospective evaluation method that can be used as a "first filter" by experts to evaluate a system during design or at the early stages of development. An additional benefit of the checklist is that it provides an easy to use, consistent evaluation method which would also assist in dialogue with manufacturers.

Elaboration of the specific question to be addressed:
Human factors research provides us with a wealth of information relevant to the design of ITS systems. A checklist based on human factors principles would incorporate this knowledge into an easy to use format. The checklist could be used to detect design characteristics that could lead to information conflict, information overload, or loss of situation awareness. Use of the checklist would help to ensure that drivers receive information concerning distance, system malfunction, and severity of the situation, for example, in the safest and most efficient manner. Other human factors considerations to be considered involve user interface consistency, operation consistency across platforms, ease of learning, skill with the system, and appropriate design to accommodate individual differences.

Normative Data on Naturalistic Driving Behavior

Objective:
The purpose of this project is to characterize driving behaviour in realistic situations by developing a driving performance database which comprises data on normal driving behaviour, in-vehicle ITS system usage, safety critical events, and crash data.

Statement of need or justification:
Data is needed on real world driving behaviour to provide valid indications of the "normal driving envelope". The information from this project would provide a basis for a general driving model against which changes in driving performance and behaviour could be evaluated. Data from this project would be valuable for generating driving scenarios for use in future research and would aid in the development of the "Simulator Reference Test Scenarios" project. It could also assist in the evaluation of surrogate safety measures as described in the "Harmonization and Validation of Surrogate Safety Measures" project.
Elaboration of the specific question to be addressed:

The focus of this project is on the driver and everyday driving behaviour. Measures would capture the typical performance for a variety of driving variables, characterize normal variability in driving behaviour, and provide an indication of safety critical situations for driving. Much is to be gained from this long term intensive study of driving behaviour. For example, with sufficient data it may become apparent that safety critical situations are ITS system specific. The extended time frame of this project permits the study of behavioural adaptation to new ITS systems. This type of behavioural change is not immediately apparent and would provide a particularly important contribution to the study of safety. The project will include different driving populations with the goal of characterizing differences in behaviour for drivers of different cultures, ages, skill levels, and locations (rural and city).

Simulator Reference Test Scenarios

Objective:

The goal of this project is to develop a catalogue of driving scenarios for use in driving simulator research. The set of scenarios should encompass the breadth of driving possibilities from uneventful everyday situations to safety critical situations.

Statement of need or justification:

There is a need for standardized scenarios for use in research to ensure that all appropriate conditions are being investigated and to facilitate comparisons across studies regardless of country and/or research institution. These scenarios can then be employed in research investigating driver use, behaviour, and performance for different ITS applications (alone or in combination). A library of standardized scenarios would also be a great benefit when setting up and calibrating driving simulators.

Elaboration of the specific question to be addressed:

The database would include scenarios for both normal driving and safety critical situations in city and rural locations. A variety of road configurations, representative of the driving environment (including both city and highway driving) would be included. Each scenario would be available in multiple versions using different combinations of characteristics (e.g., traffic density, light conditions, weather conditions, etc.) to facilitate experimental control. Other aspects to be considered involve the control of the situation depicted in the scenario and include onset of episode, timing of events during the episode, and duration of episode. Guidelines for research, based on data, could be provided for representative combinations of variables to use.

Improved Secondary Task Methodology for Evaluating Safety Effects of Driver Workload

Objective:

The goal of this project is to develop a useful secondary task methodology to calibrate workload effects of combining in-vehicle and out-of-vehicle information

Statement of need or justification:

A secondary task methodology approach to workload involves the use of a second, non-driving task to evaluate driving workload effects. In previous research, Harms (1986) was able to relate secondary task performance to on-road fatal crashes, demonstrating the value of secondary task methodology in the study

of safety. The goal of the current project is to extend this technique to the study of safety and ITS. The ultimate goal would be the creation of an objective workload redline.

Elaboration of the specific question to be addressed:
Workload can be measured using objective performance measures, subjective measures, and physiological measures. However, the appropriate control conditions and independent variables are not always included in these studies. The goal of this project is to specify a set of clearly defined secondary tasks which are sensitive to in-vehicle and on-road driver workload. Secondary task methodology has often been used in behavioural research but the theoretical assumptions underlying the technique are complex and interpretation of the data is often not straightforward. The goal of this project is to take what is useful from the past research and apply these methods to the study of safety and ITS.

Harmonization and Validation of Surrogate Safety Measures

Objective:
The goal of this project is the harmonization and validation of surrogate safety measures.

Statement of need or justification:
Surrogate measures are an important tool for ITS safety research and a variety of surrogate measures of safety are currently in use. The relationship, however, between the various measures and what they are purported to measure is not always agreed upon. There is also disagreement concerning the appropriate methodology for their use. As a result there is a need for harmonization and standardization of these measures. Until this is achieved, the usefulness of surrogate measures is undermined and meaningful comparisons across studies are difficult to make.

Elaboration of the specific question to be addressed:
Three main issues concerning surrogate measures must be addressed. First, surrogate measures must be operationally defined with unambiguous descriptions. Second, the relationship between the individual surrogate measures and safety must be empirically determined. Third, clear guidelines must be developed for the use of the measure including the specification of appropriate dependent variables. In addition, methods are also needed to compare studies using surrogate safety measures. A method to predict safety benefits would also be desirable.

Driver Learning, Retention, & Acceptance of New ITS Systems: What We Can Learn from Past Experience

Objective:
The objective of this project is to make use of available data from past introductions of ITS vehicle systems to indicate where potential problems might arise with the introduction of new systems. This knowledge would be used in an effort to avoid problems that were encountered in the past.
Statement of need or justification:
When a new ITS system is introduced, drivers must become familiar with its operation and skilled in its use.

Information is needed that can be used to improve this process of learning and skill acquisition. An examination of problems that arose in the past when new systems were introduced can be instructive. Prior problems may have been due to consistently poor design or instructions for use. Alternatively, specific characteristics and habits of the people who use the systems may produce safety risks. In this project, the information gained from past introductions of ITS will be used to improve the design and introduction of new systems with a view to improving safety.

Elaboration of the specific question to be addressed:

Multiple factors contribute to the ease with which drivers can successfully and safely incorporate new ITS systems into their driving behaviour. Some systems may be difficult to use because of the characteristics of the system itself such as poor interface design, placement of the unit, ease of use, etc. Other difficulties arise because people must become familiar with the systems and learn how they work. The factors that could potentially affect safety when using a new ITS system are the ease, difficulty, and length of time required to learn the new system. Other factors with potential safety impacts are the retention of the newly acquired skill (a potential problem for occasional users), keeping system skills up to date, and individual differences in learning. Drivers may also be faced with multiple ITS systems to use. This raises the possibility of negative transfer from the use of previous models or alternative systems and introduces the potential for interference from the use of other in-car systems. Learning, retention, and acceptance of new ITS systems are likely to be influenced by driver characteristics such as age.

Attachment 6

IHRA/PS/SR/4

ESV/IHRA PROJECT

PEDESTRIAN SAFETY

STATUS REPORT
IV

MINISTRY OF TRANSPORT, JAPAN

June 24, 1999

[Introduction]

This report describes the activities concerning IHRA/Pedestrian Safety that have been conducted after the report was submitted to the IHRA Steering Committee in November, 1998.

[Report on Activities]

The fourth Pedestrian Safety Experts meeting was held in the meeting room of the Stamford Grand Hotel near Adelaide, Australia, arranged by FORS, Australian government. The duration of the meeting was February 22 through 24 of 1999. At the meeting, information was exchanged and studies were made on specific testing methods.

A total of 14 experts participated in the meeting. They are experts selected by the governments of Australia, EU (EEVC), Japan and the U.S., experts selected by OICA and those from FORS, etc. Australia.

In succession, the Pedestrian Protection by Vehicle Design an International Seminar sponsored by FORS was held February 25 through 26 at the same hotel and at the University of Adelaide. The experts of the Pedestrian Safety Working Group were invited and joined this seminar.

1. Exchange of Information with Various Countries

(a) The Draft Regulation for Pedestrian Safety that had been under study by the EEVC/WG17 was submitted February 26 to the EU/DG III after having obtained approval by the EEVC Steering Committee.

(b) NHTSA has established a data base relative to approximately 300 cases of pedestrian accidents. The gathering of data concerning approximately 600 cases has already been completed. The final aim of NHTSA is to achieve a data base concerning 1000 cases. Moreover, they are conducting comparative tests for headforms based on three methods of ISO, EEVC and NHTSA. It is scheduled that the results are to be announced in the autumn.

(c) Concerning the EEVC test method, the German VDA conducted assessment studies by using a computer simulation in TNO. The report has revealed that the injury values for children had deteriorated in the case of motor vehicles that had been optimized based on adults so as to comply with the testing method according to the EEVC proposal.

It would be necessary for IHRA/P.S. to note this study.

(d) From Japan, the latest analysis of pedestrian accidents was introduced, and the information relative to Honda R&D pedestrian dummies was offered.

(e) There was a comment at the three-pole council of OICA that, when the pedestrian safety test method of IHRA is completed, the said test method should be incorporated into one of the World Regulations of the Global Agreement, AAM reported.

2. Updating of Accident Investigations by Various Countries

(f) Reports about updating of accident investigations were made from Australia and the U.K.

(g) The information concerning the cumulative curve of the collision speeds during accidents was offered from Japan and the U.S. It has been decided that, based on the offered information, the experts of each country send their own information to Dr. Saul, NHTSA, who will compile the data.

(h) The data concerning the accident distribution by year bracket reported from Japan, the U.S. and Germany have indicated that the peak of injuries of children occurs around 6 years of age. Consequently, it has been decided that the test tool for children be set to 6 years old.

(i) With regard to the injury section of pedestrians, priority was set previously based on the accident analysis results. The following are deliberations conducted with high priority given to heads of adults and children and legs of adults.

3. Test Tools

(j) Japan has made proposals about the study items and assessment of test tools. After completion of deliberations about additional items, etc., it has been decided that each country will submit its comment concerning this subject later. The secretariat will compile these views, which will be distributed to experts in each country through the e-mail.

(k) It has been decided that, upon obtaining additional comments, the test tools be finalized, and any possibility of use of the existing test tools of ISO, EEVC, and NHTSA, or any possibility of problems thereof be clarified. If it proves that there will be any problems, these will be addressed in the next meeting.

4. Test Procedures

(l) Japan submitted a key word table for making test procedures. And deliberations were made on this subject. After completion of deliberations, it has been decided that each country will submit its comment concerning this subject later. The secretariat will compile these views, which will be sent to experts in each country through the e-mail.

5. Injury Criteria and Evaluation Methods

(m) Upon completion of deliberations it has been decided that the HIC method be adopted as the head injury criteria. As for legs, although deliberations were made, no conclusion has been reached.

6. Full Use of Computer Simulation

(n) Deliberations were made as to how the computer simulation can be used fully concerning what sections.

(o) Furthermore, deliberations were made as to the establishment of accident reproducing simulation, test conditions, etc. However, no conclusion has been reached in connection with their concrete proposals and test conditions. These subjects will be studied continually.

7. Activities To Be Conducted From Now On

(p) Corrections and revisions will be made based on the proposals submitted by the chair person previously, thus linking to the next actions. Moreover, even after this meeting, deliberations will be continued by means of the e-mail, etc. so that the project may be expedited.

8. Revision of Action List

(q) Based on the revised action list, the deadline dates were re-confirmed together with the staff in charge of the implementation.

9. Items Assigned to Each Expert

(r) NHTSA is planning comparative tests for headforms based on three methods of ISO, EEVC and NHTSA. It is scheduled that they will report the results in the next meeting.

(s) NHTSA will prepare the sample sheet of collision speed distribution (collision speed versus cumulative percentage).

(t) Each expert will submit the collision speed distribution (collision speed versus cumulative percentage) data of its own country to NHTSA.

(u) NHTSA will report the definitions of passenger cars in the U.S. by the next meeting.

(v) NHTSA will add the information relative to the guide type headforms and children chest impactor, etc. which were developed in the 1980s to the test tool table.

(w) The secretariat will prepare the revised version of the test tool table which contains the latest information about test tools.

(x) Each expert will submit to the secretariat the comments on key word table for the test procedure by the end of March, 1999.

(y) The secretariat will compile the comments from each expert and distribute the revised version of the key word table to each expert through the e-mail by the end of May, 1999.

10. Schedule of Experts Meetings in Future

(z) It has been decided that the next experts meeting be held in Japan (Tokyo) around September to October.

(aa) The holding date will be before or after IRCOBI (Spain) and STAPP meetings (the U.S.). The chair person will decide the date, taking into consideration the efficiency for each expert and costs.

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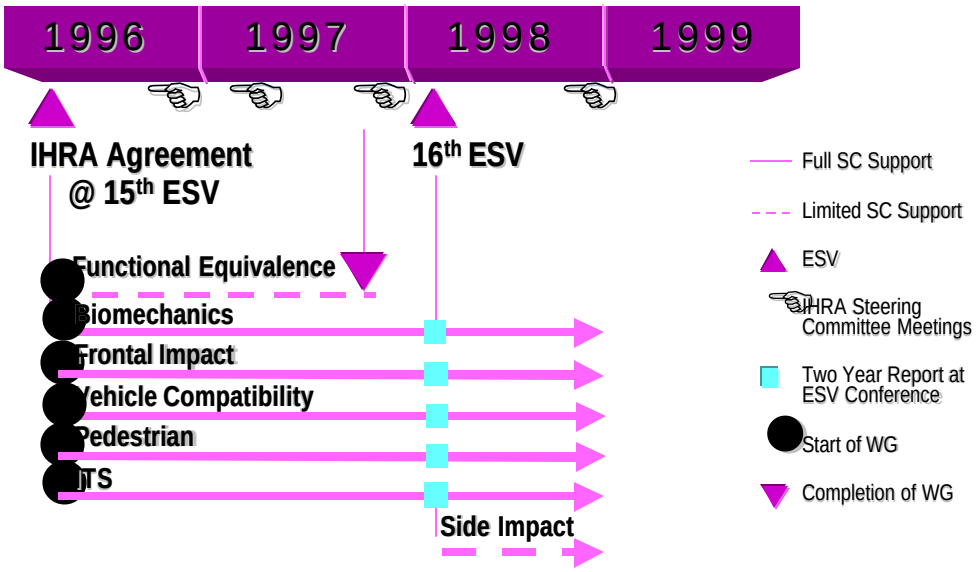
Attachment 7

Welcome to the IHRA Web Page

The International Harmonized Research Activities is an international group whose mission is to provide the automobile and light truck community (governments, industry, acedemia, consumers) with harmonized research from throughout the world. IHRA is outshoot of the Enhanced Safety of Vehicles (ESV). The member countries of ESV are represented in IHRA. IHRA was started at the15th international conference of ESV held in Melbourne Australia in 1996. The IHRA charter calls for a 5 years of harmonized research, with the final reports to ESV to coincide with the 17th ESV conference to be held in the Netherlands in 2001.

The IHRA is comprised of a steering committee and 6 working groups.

This site is under construction and expected to be fully operational by March 1999



- The Biomechanics Page
- The Frontal Impact Page
- The Vehicle Compatibility Page
- The Pedestrian Page
- The Intelligent Transportation Systems Page

- The Side Impact Page

Attachment 8

JAPAN'S VIEW ON IHRA ACTIVITIES

(1999/6 DRAFT)

The Government of Japan has an understanding that the IHRA has launched its activities with a view to achieving uniformed motor vehicle safety standards, in view of the varying motor vehicle standards that are employed at present in Europe, the U.S., Japan, Canada, Australia, and so forth. In other words, we have a view that the purpose of the IHRA activities is to establish an internationally-uniformed test procedure by May, 2001, for each of the items, on which we have been working till today, and that each country's introduction of the thus-prepared test procedures into her domestic regulations is the premise term for advancing the IHRA activities.

However, after seeing that the recent activities of the Working Groups in the IHRA, we feel that there are some differences among the participating countries' stances. For example, concerning the side impact test procedure, the test procedures (test conditions, dummies and assessment criteria) which have been adopted at present in Europe, Japan and the U.S. have greatly varied. Hence, the Japanese Ministry of Transport deems that the IHRA Side Impact Working Group should conduct deliberations with the top priority placed on the subject of uniformed test procedures. Nevertheless, the deliberations seem to be made on preparing test procedures other than the currently-adopted test procedures. In other words, some discussions are being made so as to draft other test procedures, such as pole side impact test procedure and test procedures employing the AF05 dummy or child

dummy.

As we have pointed out, the activities of the present Working Groups seem to be deviating from the original purpose of early achievement of international harmonization of motor vehicle standards. According to our observation, the IHRA activities are international cooperative activities for mere testing and research. If our IHRA activities were to be advanced without any alteration, each WG would propose various, different test procedures, for example, a test procedure using a AF05 dummy, a test procedure using child dummy and test procedure using pole side impact, and thereby each country would adopt its own particular test procedure. Therefore, there are possibilities that no advancement has been made from the present situation toward the harmonization of standards.

In view of such situation, we at the Japanese Ministry of Transport would like to ask the IHRA S.C. chair person to confirm that the future IHRA activities are aiming at mere test and research, or it is necessary to clarify our relationship with the standard harmonization activities in the WP29.

After we have made confirmation of this subject, we would like to propose that each WG draft its own target concerning strategic results for the year 2001.